REMARKS

Claims 1, 3-13 and 15-16, 18-19 and 21-33 are pending. No new matter has been added.

Applicants would like to thank Examiner for withdrawal of rejection under 35 U.S.C. § 102(b) in view of Ruoff.

Rejection under 35 U.S.C. § 103(a)

Ruoff in view of Ma

The Examiner rejected claims 1, 3-9, 11, 13, 15, 16, 18, 19, 21-25, 27 and 29-33 under 35 U.S.C § 103(a) as being anticipated by U.S. Patent No. 5,547,748 to Ruoff et al. ("Ruoff") as evidenced by Valencia et al. "Understanding the stabilization of metal carbide endohedral fullerenes $M_2C_2@C_{82}$ and related systems," *J. Phys. Chem.*, 2008, 112, 4550-4555 ("Valencia") in view of Ma et al., "Processing and properties of carbon nanotubes-nano-SiC ceramic," *Journal of Materials Science* 1998, 33, 5243-5246 ("Ma") (see Office Action at 2). Claims 1, 11, 21 and 27 and are independent. Applicants respectfully disagree.

Each of claims 1, 11, 21 and 27 relates to a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide.

Ruoff does not teach or suggest the composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide. Ruoff describes the encapsulation of the metal carbides inside multilayered polyhedral shells of carbon (nanoencapsulates), the resulting nanoencapsulate materials have uses as composite materials (see Ruoff, Abstract). The nanoencapsulate is described as having "a polyhedral outer shell of nested, concentric layers of carbon, which defines an inner cavity or void. Encapsulated within this cavity is a metal" (see Ruoff, col. 2, lines 33-36). Ruoff describes the deposition of the carbonaceous material by the carbon arc process (see Ruoff, col. 10, lines 14-17). In the carbon arc process used described by Ruoff, "a carbonaceous deposit forms on one of the graphite rods, from which the nanoencapsulates are recovered. A soot is also produced during the process, and when the anode rod is drilled out and packed with Gd, Gd_2O_3 or Nd_2O_3, a new

structure has been found in the soot" (see Ruoff, col. 10, lines 15-19). Here, as with the other descriptions of the carbon arc process described throughout Ruoff, the carbon structures are produced first, and then the metal deposits in the open structures in the carbon network.

The carbon nanotubes described in the instant application are grown from a carbide particle directly by thermochemical means. The carbide substrate, and no other external source, supplies the carbon, thus ensuring true chemical attachment of the core and the nanotube surface layer (see specification, p. 6-7). Indeed, in the process described by Ruoff, the order of addition of carbon and metal structures is the opposite of order in which materials are added in the process described in the instant application. The composition described by Ruoff, although made from similar material, differs from the claimed composition. The process by which Ruoff makes nanoparticles does not produce material within the scope of the claims.

Ma does not remedy these deficiencies. Ma describes dispersing nano-SiC powders and carbon nanotubes in butyl alcohol using an ultrasonic shaker followed by hot-pressing (see Ma, Abstract). The process is a purely mechanical mixing of carbon nanotubes and SiC followed by hot-pressing. Ma makes no mention of a chemically bonded carbon nanotube covered carbide substrate. A person of ordinary skill in the art would understand that modifying the method disclosed by Ruoff to use the materials disclosed by Ma would not form a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide, as described in claim 1. As a result, the person of ordinary skill in the art would not be motivated to combine the references. Nor would the person of ordinary skill in the art have a reasonable expectation of success. For at least these reasons, independent claims 1, 11, 21 and 27 are patentable over Ruoff in view of Ma.

Furthermore, the Examiner relied on hindsight to reach this obviousness determination. The Federal Circuit has stated in W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303 (Fed. Cir. 1983) that "[t]o imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *Id.*, at 312-13. It is essential that "the decisionmaker forget what he or she has been taught...about the claimed invention and cast the mind back to the time

the invention was made...to occupy the mind of one skilled in the art who is presented only with references, and who is normally guided by the then-accepted wisdom in the art." *Id.*, at 313. The mere fact that references can be combined or modified does not render the resultant combination obvious, unless the reference also suggests the desirability of the combination. *See* MPEP 2143.01 (citing *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990)). In other words, it is legal error for the Examiner to use hindsight reconstruction to pick and choose among isolated disclosures in the cited references to deprecate the claimed invention.

The Examiner argues that the combination of Ruoff and Ma each the claimed product although the inventions are formed via a different process (see Office Action at 5). The differences of the claimed composition and the compositions taught by Ruoff and Ma is attested to by John Vander Sande, a co-inventor of the subject matter of present application, in a declaration under 37 C.F.R. 1.132, attached at Appendix A of the response. In particular, Dr. Vander Sande noted that in,

> ... the carbon arc process described throughout Ruoff, the carbon structures are produced first, and then the metal deposits in the open structures in the carbon network.
>
> The nanotubes described in the instant application are grown from the carbide particle directly by thermochemical means, with the carbide substrate and no other external source supplying the carbon, ensuring the true chemical bonding of the substrate and the nanotube surface layer (see specification, para. [0025]-[0028]). Indeed, in the process described by Ruoff, the order of addition of carbon and metal structures is the opposite of order in which materials are added in the process described in the instant application.

See Declaration of John Vander Sande at paragraph 4.

In addition, the Examiner contends that "one of ordinary skill in the art would have considered it logical that the combination of Ruoff and Ma would have been successful (see Office Action at 6). The lack of motivation to combine Ruoff and Ma is attested to by Vander Sande in the attached declaration. In particular, Dr. Vander Sande noted that

> The process [described in Ma] is a purely mechanical mixing of carbon nanotubes and SiC followed by hot-pressing. Ma makes no mention of a chemically bonded carbon nanotube covered carbide substrate. A person of ordinary skill in the art would understand

> that it would be impossible to modify the method disclosed by Ruoff to use the materials disclosed by Ma to form a composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide, as described in claim 1 of the instant application. As a result, the person of ordinary skill in the art would not be motivated to combine the references. Nor would the person of ordinary skill in the art have a reasonable expectation of success.

See Declaration of John Vander Sande at paragraph 4.

Thus, neither Ruoff, Ma, nor their combination teaches or suggests all the elements of claim 1. Accordingly, claims 2, 14 and 20 are patentable over Ruoff in view of Ma. Applicants respectfully request reconsideration and withdrawal of this rejection.

Ruoff

The Examiner rejected claims 10, 12, 26 and 28 under 35 U.S.C § 103(a) as being unpatentable over Ruoff (see page 4 of the Office Action). Claims 10, 12, 26 and 28 depend from independent claims 1, 11, 21 and 27.

As discussed above, Ruoff does not teach or suggest all elements of claims 1, 11, 21 and 27. Ruoff does not teach or suggest the composition including a particle including a core and a shell, the core including a metal carbide and the shell including a carbon nanotube chemically attached to at least a portion of a surface of the core, wherein the metal carbide is silicon carbide (see claims 1, 11, 21 and 27).

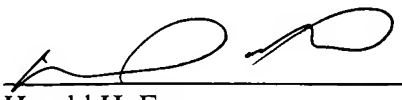
Thus, Ruoff does not teach or suggest all elements of claims 10, 12, 26 and 28. Accordingly claims 10, 12, 26 and 28 are patentable over Ruoff. Applicants respectfully request reconsideration and withdrawal of this rejection.

CONCLUSION

Applicants ask that the claims be allowed. A petition for a two-month extension of time accompanies this response. Should any fees be required by the present Reply, the Commissioner is hereby authorized to charge Deposit Account 19-4293.

Respectfully submitted,

Date: 7-10-



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